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Review Article

Augmented reality (AR) and virtual reality (VR) applied in dentistry

Ta-Ko Huang [a], Chi-Hsun Yang [b], Yu-Hsin Hsieh [c,d], Jen-Chyan Wang [e,f], Chun-Cheng Hung [e,f,*]

[a] *School of Dentistry, Kaohsiung Medical University, Kaohsiung, Taiwan*
[b] *Department of Biomedical Engineering, National Cheng Kung University, Tainan City, Taiwan*
[c] *Department of Business Administration, University of North Carolina at Greensboro, Greensboro, USA*
[d] *Department of Engineering Science and Ocean Engineering, National Taiwan University, Taipei, Taiwan*
[e] *Department of Prosthodontics, Kaohsiung Medical University Hospital, Kaohsiung, Taiwan*
[f] *School of Dentistry, College of Dental Medicine, Kaohsiung Medical University, Kaohsiung, Taiwan*

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Abstract The OSCE is a reliable evaluation method to estimate the preclinical examination of dental students. The most ideal assessment for OSCE is used the augmented reality simulator to evaluate. This literature review investigated a recently developed in virtual reality (VR) and augmented reality (AR) starting of the dental history to the progress of the dental skill. As result of the lacking of technology, it needs to depend on other device increasing the success rate and decreasing the risk of the surgery. The development of tracking unit changed the surgical and educational way. Clinical surgery is based on mature education. VR and AR simultaneously affected the skill of the training lesson and navigation system. Widely, the VR and AR not only applied in the dental training lesson and surgery, but also improved all field in our life.

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* Corresponding author. 100, Shih-Chuan 1st Road, Kaohsiung, 80708, Taiwan.
E-mail address: chuchh@kmu.edu.tw (C.-C. Hung).

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Introduction

With the increase in the elderly population and the economic growth, the concept of oral health gradually increased, and dental and dental health care issues are increasingly important. Due to the high incidence and prevalence of today's global oral diseases, the global market for oral medical equipment in 2016 was $ 23.99 billion up to 4.0% from 2015, and the market was expected to reach $ 29.09 billion by 2020.2015—2020 growth rate was up to 4.7%, coupled with the incidence of the poor than other socio-economic groups. The oral disease has become an important public health problem, and promote the global oral medical market continues to grow.

In addition, according to World Health Organization statistics show that more than 60% of school-age children worldwide and nearly 100% of adults have dental caries status, and 35—44 years of adult population, nearly 20% suffering from severe teeth disease, follow-up will lead to the possibility of missing teeth. As for the 65—74 year old population, the total tooth loss rate is as high as nearly 30% [1]. With the increase in the number of elderly population and the increasingly aging society, coupled with the majority of elderly people in the treatment rate is generally low. It will lead to long-term sustained increase in oral medical needs.

Nowadays, there are a lot of skills about the progresses in the computer-based technologies such as augmented reality (AR) and virtual reality (VR). In the two kinds of reality, AR is the first application began to widely use. AR, in which 3D virtual objects are integrated into a 3D real environment in real time. AR is to "virtualize" the virtual image into the real space, creating a completely virtual space around the user's eyes to replace the real space. To make the users see a world which have a real environment and generated by the computer graphics over a real scene [2]. And the VR offered the users a real, inside virtual 3D model [3—5]. According to the display, to build a three-dimensional, seemingly true virtual world in the user's eyes. Recently, VR also designed head mount display with special glasses to cover the user's surrounding vision to achieve the interaction situation.

With the increasing demand for dental implants, the dentist-related faculties or post-graduated year (PGY) professional competencies, clinical training and experience accumulation are more important, and these technologies are directly reflected in the school's education. Through the complete education and training with realistic exercises and assessments, in order to training a dentist. Therefore, whether it is on the education side or the clinical side, increasingly mature technology development developed by the auxiliary products will become more and more important role in the surgery and education training process.

The history of dentistry

The history of dentistry is almost as long as the history of human civilization. The progress of science and technology, the application of technology used in the dental became more and more mature. From the initial, using pliers to remove the tooth, wire to lock loose teeth, and the dental appliance and dental bridge. To the beginning of the 17th and 18th century, using the tooth filling [6], gradually developed to the initial bone as a denture concept to replace the loose teeth. To use the tooth sets of metal wire and fixed appliance techniques to correct the tooth position [7]. Until today, dental expertise is currently used to prevent and treat common oral diseases, namely dental caries and periodontal disease, and the field also includes common repair, extraction, implant, root canal therapy and calculus removal.

Nowadays, dentists in the United States and European countries must pass both written and technical examinations before obtaining a license. Dentistry in Japan and China also has fully implemented the above mentioned examination policies. In view of this, enough practice, professional knowledge in medical and dental colleges. The better way of learning is without question a developing trend for global dental education. Learning educational equipment and method built around such technology will be a must-have for dental universities around the world.

Informative technological advances in dentistry

With the advanced development of Information Technology (IT), dental solutions lead by computer and internet technologies have made significant progress all over the world. Digital dental solutions will be the trend for the professional dental field in the future. The rapid development of digital dental solutions has been applied in both the clinical dental field as well as the dental education field. This trend will gradually challenge both traditional dental clinical practices and dental education learning methods.

With the medical image of the increasingly mature can help physicians to identify the patient's affected area and to make a different cure. The new technology which assisted the doctor has gradually been mature. The Image-guided therapy (IGT) [8,9] and Image-guided interventions (IGI) technology development [10—15], the image recognition and location of tracking system [16], coupled with computer computing [17], combined computed tomography, position tracker, display and PC to achieve tracking location and surgical instruments immediately. By calculating the position of the medical images and surgical tools [13], to provide more accurate accuracy in the surgical position or learning lesson Recently, the current of article about the nerve surgery published in PubMed more than 1400 [18]. In the nerve surgery also combined with the above technology to achieve the effect of surgical real-time. And because good image clarity will affect the overall system of precision [19], medical imaging such as CT technology advances, with a good tracking system also reduces the risk of surgery and mistakes [12].

Educational applications of dentistry

Dr. John M. Harris opened the world's first dental school in Bridge, and helped establish the dental establishment as a health career [13]. The school was opened on February 21, 1828 and is now the Harris Dental Museum [10]. Studies have shown that graduates who graduated from different countries [11] or different dental schools may have